

## **The Marine Amphipod Crustaceans of Ulreung Island, Korea: Part II**

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### **울릉도 해역의 단각류(갑각류) II**

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### **적 요**

울릉도의 해양 단각류상을 조사하기 위하여 조사기간인 1989년 7월부터 1990년 8월사이에 울릉도 해안의 8개 지소에서 채집한 단각류 표본들 중에서 Anamixidae, Colomastigidae, Eophliantidae, Eusiridae, Hyalidae 등 5과에 속하는 것들을 동정한 결과 7속, 9종이 얻어졌다. 이 중에서 *Paranamixis denticulus*, *Colomastix prionotos*, *Hyale bisaeta* 등 3종은 신종이었고, *Ceinina japonica*, *Eusiroides monoculoides japonicus*, *Allorchestes angusta* 등 3종은 한국 미기록종이었다. 신종과 한국미기록종 6종을 기재하고 이 6종을 포함한 8종의 그림을 작성하였다.

Key words: Crustacea, Amphipoda, Gammaridea, Ulreung Island, Korea.

This study is the second part of a series of publication dealing with the species of marine amphipods from Ulreung Island. This study deals with the species in five families (Anamixidae, Colomastigidae, Eophliantidae, Eusiridae, and Hyalidae) of gammaridean amphipods from Ulreung Island.

The historic review of studies on the marine amphipods from Korea and Ulreung Island was presented in the first part of this series (Kim and Kim, 1991). The key to the families of gammaridean amphipods from Ulreung Island was also provided in the first part of this series.

## MATERIALS AND METHODS

This study was based on the material collected, during the period from July 1989 to August 1990, at eight localities in Ulreung Island (Fig. 1). Specimens were collected largely by formalin wash method (Barnard, 1979). In the laboratory, the amphipods were sorted out under a high power stereoscopic microscope and preserved in 70% alcohol. All specimens collected from shallow subtidal zone were taken by scuba divers. In addition to materials mentioned above, many materials were obtained from fishing nets.

The body length was measured from the tip of rostrum to the base of the telson, along the dorsal margin of the body. The "Material Examined" section lists all specimens examined. The classification of superfami-

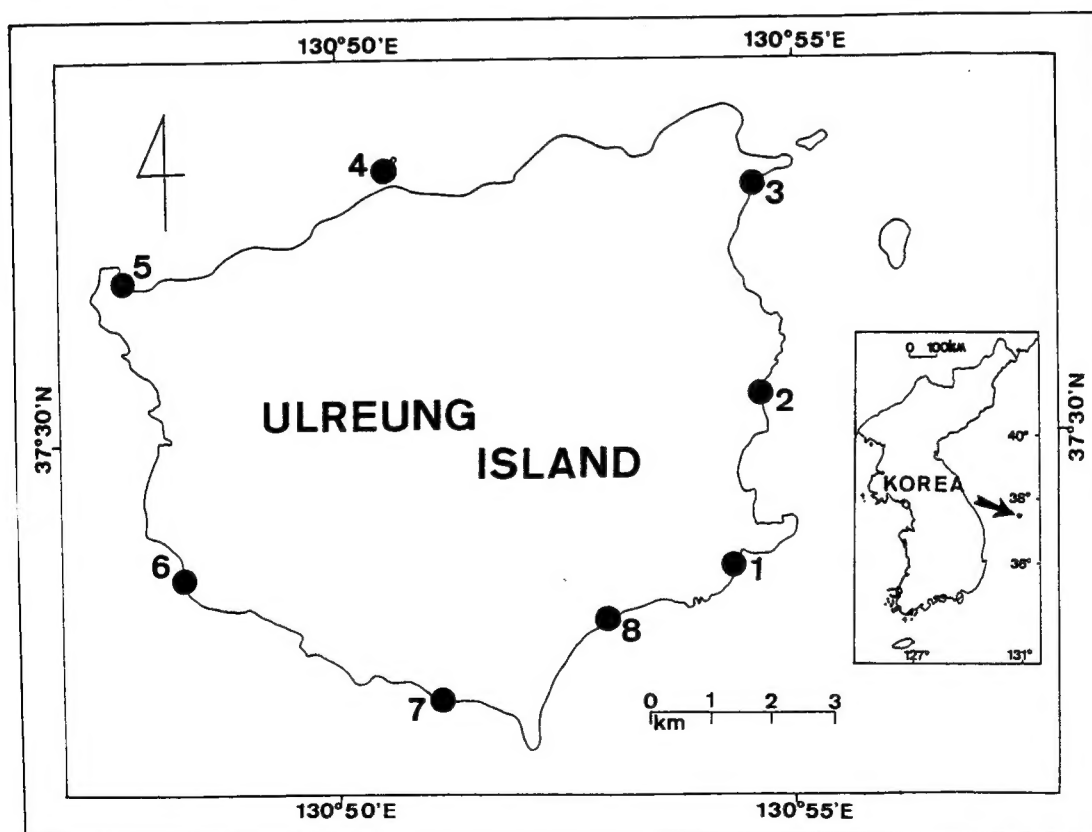


Fig. 1. The map showing the localities where the materials were collected. 1, Dodong(도동); 2, Naesujön(내수전); 3, Sömmok(섬목); 4, Hyölam(혈암); 5, Taepungch'wi(대풍취); 6, Kul-am(굴암); 7, Tonggumi(통구미); 8, Sadong(사동).

ly and family levels was based on the systems of Barnard (1972b), and Bowman and Abele (1982). All materials examined are deposited in the Department of Molecular Biology, Seoul National University.

## SYSTEMATIC ACCOUNTS

Superclass Crustacea Pennant, 1777  
 Class Malacostraca Latreille, 1806  
 Subclass Eumalacostraca Grobben, 1892  
 Superorder Peracarida Calman, 1904  
 Order Amphipoda Latreille, 1816  
 Suborder Gammaridea Latreille, 1803  
 Family Anamixidae Stebbing, 1897  
 Genus *Paranamixis* Schellenberg, 1938

### 1. *Paranamixis denticulus*, new species

(Figs. 2,3)

**Material Examined:** Holotype: ♂ (*Paranamixis* stage), body length 5mm, Tonggumi, July 12, 1989. Paratypes: 3 ♂♂, collection details same as holotype; 1 ♂, Hyölam, July 14, 1989; 1 ♂, Taepungch'wi, July 15, 1989. All paratypes are in the *Paranamixis* stage.

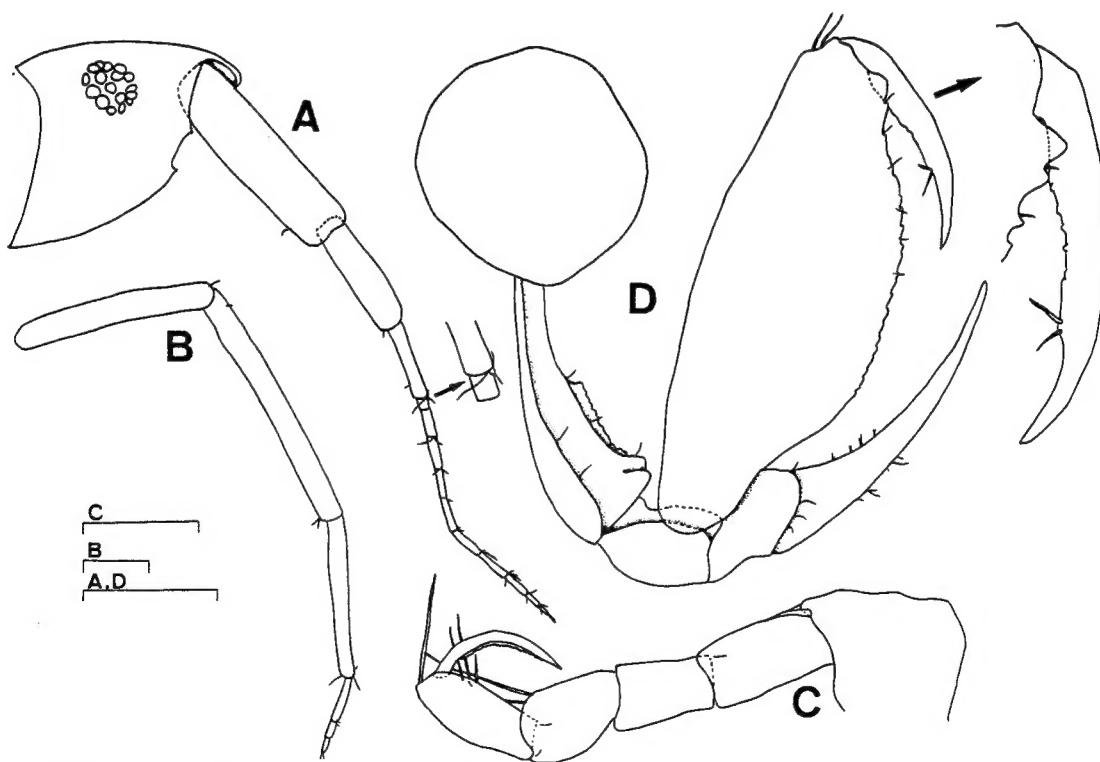


Fig. 2. *Paranamixis denticulus*, new species, holotype male (*Paranamixis* stage), body length 5mm: A, head and antenna 1; B, left antenna 2; C, left maxilliped; D, right gnathopod 2. Scale bars: A, D=0.3mm; B=0.1mm; C=0.5mm.

**Description of *Paranamixis* stage:** Head (Fig. 2A) triangular, dorsal margin produced distally; anterior and ventral margins continuously rounded with one concave part medially, and that concave part terminated with sharp teeth on each end. Eye circular, composed of several yellowish ommatidia, and situated on near dorsal margin of head.

Antenna 1 (Fig. 2A) almost same as long as antenna 2; geniculated to below dorsodistal projection of head; article 1 elongated, same as long as articles 2,3 combined, and almost naked; article 2 about 60% as long as article 1, and almost naked; article 3 about 60% as long as article 2, and almost naked; the first segment of flagellum short, flagellum composed of 10 segments; accessory flagellum uniarticulate, with one apical and two lateral setae. Article 3 of antenna 2 (Fig. 2B) about 80% as long as article 4; article 5 almost same as long as article 3; peduncular articles almost naked; flagellum triarticulate, first segment longest and about 30% as long as peduncular article 5.

Maxilliped (Fig. 2C) slender; inner plate obsoleted, inner lobe of outer plate vestigial; with one strong seta on inner margin of base distally; palp four articulate, articles 1-3 subequal in length, article 2 with two long setae on inner margin distally, article 3 with several long setae on inner margin, dactyl curved, and longer than article 3 and inner margin dentate.

Coxa of gnathopod 2 (Fig. 2D) broadly rounded. Article 2 dilatant toward distal part; inner and outer margins of dorsal surface with two setae; inner margin produced distally and with one seta, inner part of inner margin denticulate; ventral margin almost straight. Article 3 relatively short, and shorter than half

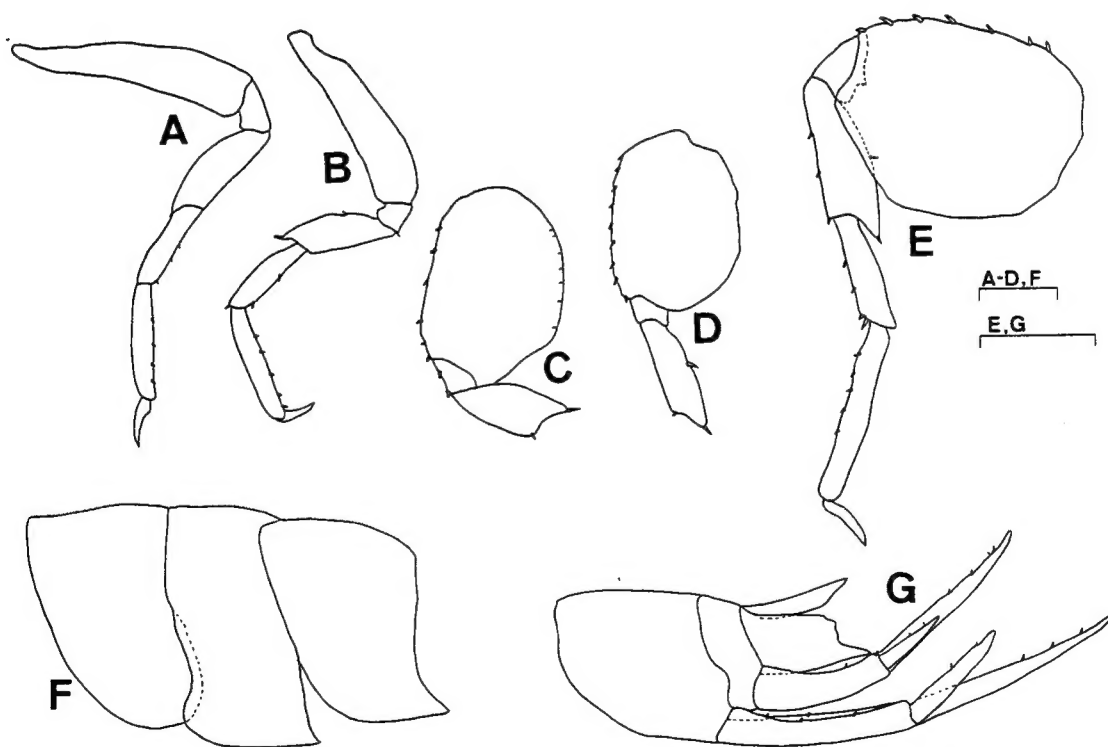


Fig. 3. *Paranamixis denticulus*, new species, holotype male (*Paranamixis* stage), body length 5mm: A, left pereopod 3; B, left pereopod 4; C, left pereopod 5; D, left pereopod 6; E, left pereopod 7; F, left pleonal epimera 1-3; G, left urosomites 1-3, uropods, and telson. Scale bars = 0.2mm.

of article 2. Ventral margin of article 4 concave, distal margin with three setae. Article 5 sickle in shape, almost overreaching middle of ventral margin of article 6, with five bundles of setae marginally on inner part. Ventral margin of article 6 convex and dentate; teeth on ventral margin get stouter toward distal part and one tooth on joint part with dactyl strongest, each tooth with setae; dorsal margin almost straight, slightly concave on distal part, with two long setae distally. Dactyl sickle in shape, ventral margin with a pair of setae on medial part, and with five denticles from medial to proximal part, joint point with article 6 slightly concave.

Pereopod 3 (Fig. 3A) slightly longer than pereopod 4 (Fig. 3B). Dorsal margin of article 4 of pereopod 4 produced with one spine distally. In pereopods 3, 4, ventral margin of article 5 with two or three spines; ventral margin of article 6 with four or five spines; dactyl small.

Pereopods 5-7 (Fig. 3C-E) shorter than pereopod 3. In pereopods 5-7, article 2 with six or eight spines on dorsal margin distally, ventral margin obliquely cut down; ventral margin of article 4 produced distally, article 4 with spines on dorsal and ventral margins; articles 5,6 with two or five spines on dorsal margin.

Uropod 1 (Fig. 3G) far reaching uropod 2; peduncle shorter than inner ramus, with three spines on outer margin and one spine on inner margin of dorsal surface; outer ramus half as long as inner ramus, with two spines; inner ramus elongated, with three spines. Peduncle of uropod 2 shorter than inner ramus, with one spine on outer margin of dorsal surface and one spine on outer margin distally. Uropod 3 missing.

Telson (Fig. 3G) broad, distal margin rounded.

Posteroventral corner of pleonal epimeron 1 (Fig. 3F) round, posterior margin convex. Posteroventral corner of pleonal epimeron 2 produced backward, posterior margin slightly concave. Posteroventral corner of pleonal epimeron 3 strongly produced backward, posterior margin strongly concave.

**Remarks:** Five species in the genus *Paranamixis* are known in the world until now. The present species is easily distinguished from *Paranamixis bocki* Schellenberg, 1938 and *Paranamixis indicus* Sivaprakasam, 1968 in the denticulated and dilated dorsodistal margin of article 2 of male gnathopod 2. This new species is close to *Paranamixis madagascarensis* Ledoyer, 1982 and *Paranamixis excavatus* Ledoyer, 1978 and *Paranamixis aberro* Hirayama, 1983 in the denticulated and dilated dorsal margin of article 2 of male gnathopod 2 distally. But, the present species is readily distinguished from *P. madagascarensis* in the spinose uropods. This new species is easily distinguished from *P. excavatus* and *P. aberro* by the following characteristics: The coxa 2 of *P. excavatus* is denticulated on dorsal margin and bearing a conspicuous notch. But, in the present species coxa 2 continuously rounded. In *P. aberro*, ventral margins of article 6 and dactyl of male gnathopod 2 are not dentated. But, in this new species those parts are conspicuously dentated.

**Etymology:** This species has article 2 of male gnathopod 2 which is strongly denticulated and dilated dorsodistally. The specific name is from the Latin *denticulus* (small tooth).

Family Colomastigidae Stebbing, 1899

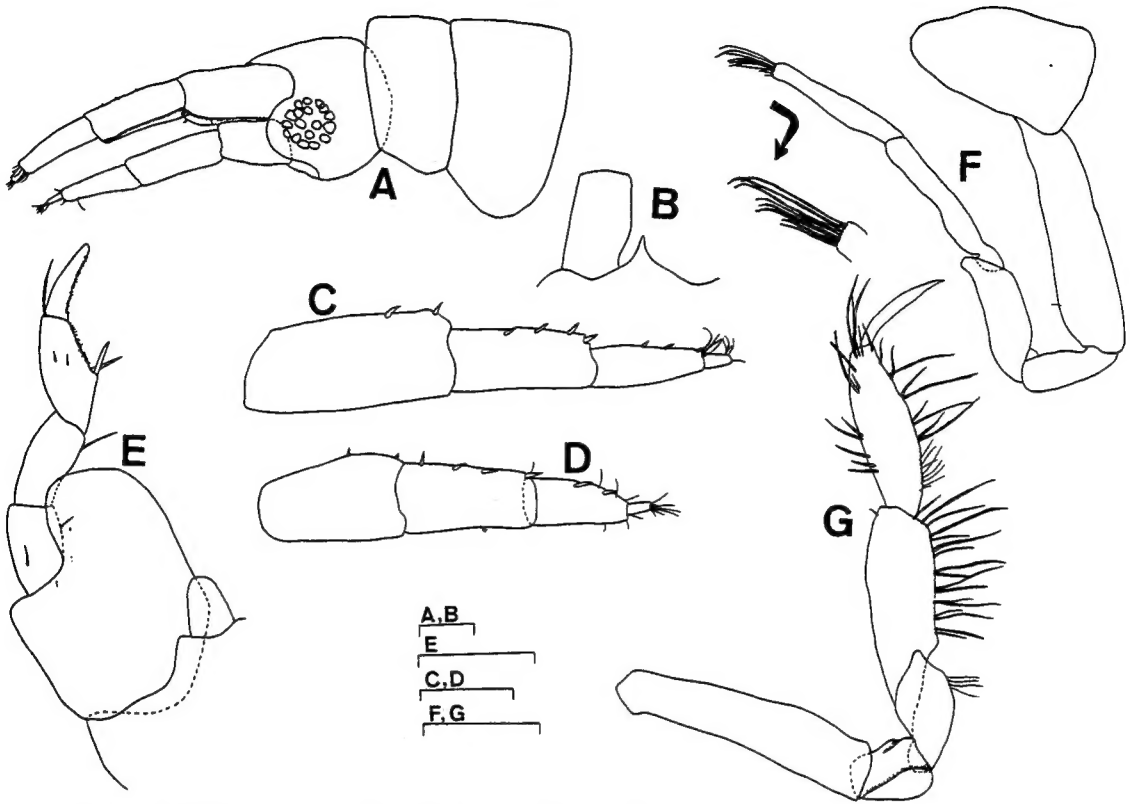
Genus *Colomastix* Grube, 1861

## 2. *Colomastix prionotos*, new species

(Figs. 4, 5)

**Material Examined:** Holotype: ♀, body length 3.8mm, Tonggumi, July 12, 1989. Paratypes: 7 ♀♀, collection details same as holotype.

**Description of holotype female:** Head (Fig. 4A, B) shorter than pereonites 1,2 combined; rostrum con-



**Fig. 4.** *Colomastix prionotos*, new species, holotype female, body length 3.8mm: A, lateral view of head, antennae, and pereonites 1,2; B, dorsal view of distal part of head; C, inner view of right antenna 1; D, inner view of right antenna 2; E, left maxilliped; F, left gnathopod 1; G, right gnathopod 2. Scale bars: A-D, F, G=0.2mm; E=0.1mm.

spicuously produced, far reaching distal part of lateral cephalic lobe and reaching proximal 37.5% of visible part of peduncular article 1 of antenna 1; lateral cephalic lobe broadly rounded. Eye circular and large, and composed of several yellowish ommatidia.

Antenna 1 (Fig. 4A, C) almost same as long as antenna 2 (Fig. 4A, D). Article 1 longer than article 2, with two spines on inner dorsal margin, and with ventral outer ridge bearing one slender spine in outer view. Article 2 longer than article 3, with four spines on inner dorsal margin and with ventral outer ridge naked in outer view. Article 3 with two spines on inner dorsal margin, and with dense setae on distal margin. Flagellum strong, unisegmented.

Article 3 of antenna 2 (Fig. 4A, D) almost as long as article 4, with two spines on inner dorsal margin. Article 4 longer than article 5, with three spines on inner dorsal margin and one spine on inner dorsal margin distally. Article 5 with two spines and several setae on inner dorsal margin. Flagellum bisegmented; first segment 3.5 times as long as second segment, and each segment with setae densely.

Inner plate of maxilliped (Fig. 4E) entire, and naked; outer plate broad, far overreaching distal end of article 1 of palp; palp four-articulate, article 1 of palp slightly shorter than article 2, and with two setae on inner surface and inner margin, article 2 with one long seta on inner margin distally, article 3 almost same as long as article 2, and inner margin of article 3 obliquely truncate from middle to distal part, with

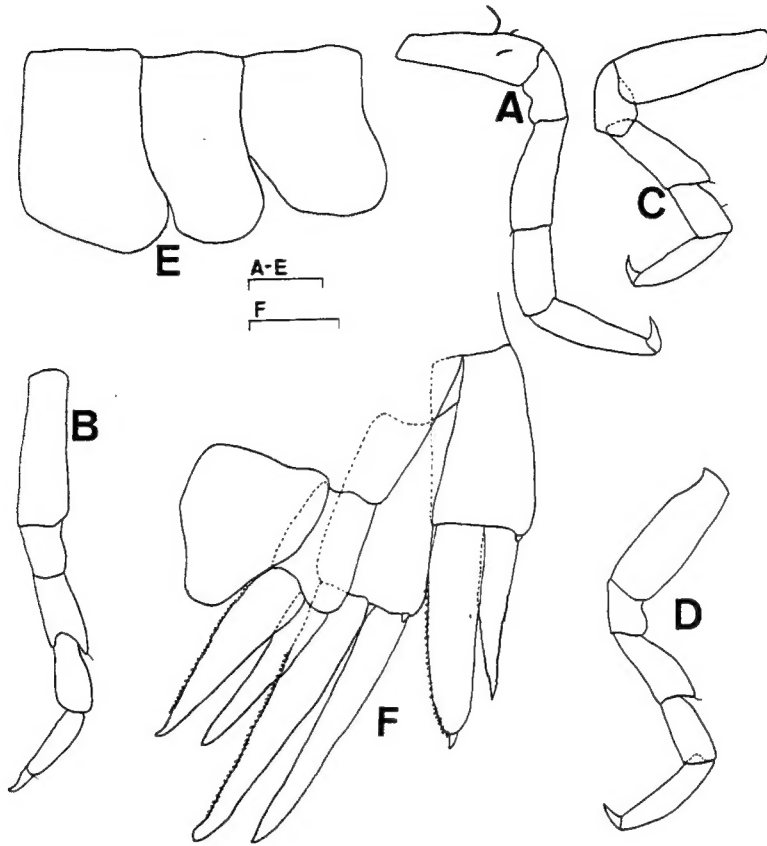


Fig. 5. *Colomastix prionotos*, new species, holotype female, body length 3.8mm: A, left pereopod 3; B, left pereopod 5; C, left pereopod 6; D, left pereopod 7; E, left pleonal epimera 1-3; F, dorsal view of right uropods and telson. Scale bars: A-E=0.2mm; F=0.1mm.

two strong setae on middle, and with two short setae on inner surface, dactyl shorter than article 3, and inner margin pectinate.

Coxa of gnathopod 1 (Fig. 4F) narrowing toward anterior part, and produced with round tip. Article 2 relatively broad, slightly shorter than articles 5,6 combined. Article 3 elongated, about 70% as long as article 4. Article 4 shorter and broader than article 5 and ventral margin produced distally, and broader than article 5. Article 5 almost same as long as article 6. Article 6 with eight long curved setae on distal margin.

Article 5 of gnathopod 2 (Fig. 4G) about 1.25 time as long as article 6, ventral margin lined with nine bundles of long and thick setae. Palm and ventral margin of article 6 continuously rounded; dorsal and ventral margins of article 6 densely lined with long and thick setae. Dactyl reaching middle part of ventral margin of article 6.

Pereopods 3,4 (Fig. 5A) longer than pereopods 5-7. In pereopods 3, 4, article 2 almost same as long as article 6, with three setae; articles almost naked. In pereopods 5-7 (Fig. 5B-D), article 2 longer than article 6; dorsal margin of article 4 moderately produced with one seta distally.

Inner ramus of uropod 1 (Fig. 5F) far overreaching middle of outer ramus of uropod 2; Peduncle almost same as long as outer ramus, with one blunt spine on outer distal margin; outer ramus styliform, about 75% as long as inner ramus, and inner and outer margins serrate; inner ramus relatively broad, inner margin

strongly dentate, and with one strong spine on apex. Peduncle of uropod 2 about 67% as long as inner ramus, with one blunt spine on outer distal margin; outer ramus slightly shorter than inner ramus, and naked; inner margin of inner ramus strongly dentate. Peduncle of upopod 3 about 60% as long as inner ramus; outer ramus slightly shorter than inner ramus, and naked; inner margin of inner ramus strongly dentate.

Telson (Fig. 5F) broadly triangular in shape, entire, bearing smooth distal margin, and naked.

Posteroventral corner of pleonal epimera 1-3 (Fig. 5E) broadly rounded.

**Habitat:** Commensal with a species of sponge, *Halichondria oshoro* Tanita, 1961.

**Remarks:** This new species closely related to *Colomastix pusilla* Grube, 1861 and *Colomastix truncatipes* Ledoyer, 1979 in the entire inner plate of maxilliped and the subequal rami of uropod 3. But, the present species is distinguished from *C. pusilla*, rather cosmopolitan species, by the following characteristics: (1) Pereopods of *C. pusilla* bearing several spines, while in the present species, pereopods are almost naked; (2) Inner ramus of uropod 3 in the present species is broader than that of *C. pusilla*; (3) Distal margin of telson in the present species is rather smooth, while in *C. pusilla*, that part is serrated.

This new species is easily distinguished from *C. truncatipes*, reported from Indonesia, ile Maurice, and Madagascar, in the following characteristics: (1) The apex of inner ramus of uropod 1 in the present species

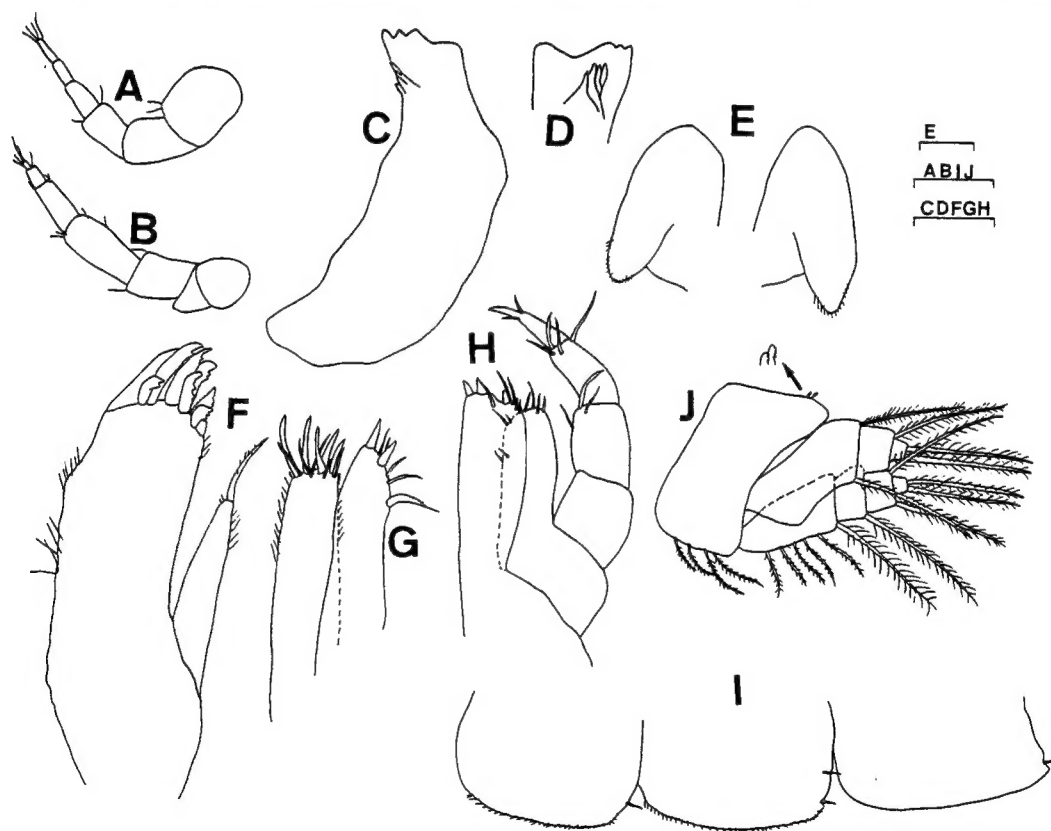


Fig. 6. *Ceinina japonica* Stephensen, 1933, ovigerous female, body length 5mm: A, left antenna 1; B, left antenna 2; C, right mandible; D, incisor and lacinia mobilis of left mandible; E, lower lip; F, left maxilla 1; G, left maxilla 2; H, right maxilliped; I, left pleonal epimera 1-3; J, pleopod 3. Scale bars: A,B,I,J = 0.2mm; C-H = 0.1mm.



is more sharply pointed than that part of *C. truncatipes*; (2) The outer distal margins of uropods 1,2 in the present species with one blunt spine, while in *G. truncatipes*, those parts without spine; (3) Outer ridges on articles 1,2 of antenna 1 in the present species without spine, while in *C. truncatipes*, those parts with several spines.

**Etymology:** The Greek *prionotos* (serrate) refers to the serrate inner rami of each uropod of this species.

Family Eophliantidae Sheard, 1936

Genus *Ceinina* Stephensen, 1933

### 3. *Ceinina japonica* Stephensen, 1933

(Figs. 6-8)

*Ceinina japonica* Stephensen, 1933 (pp. 63-68, figs. 1-4); Barnard, 1972b (p. 183).

*Wandelia japonensis* Nicholls, 1939 (pp. 325-328, figs. 6,7).

**Material Examined:** 50♀♀, Taepungch'wi, July 15, 1989.

**Description of ovigerous female:** Antenna 1 (Fig. 6A) as long as antenna 2 (Fig. 6B); peduncular articles almost equal in length. peduncular article 1 most expanded; flagellum composed of three-segments. Peduncular article 4 of antenna 2 most expanded among peduncular articles: flagellum composed of two small segments.

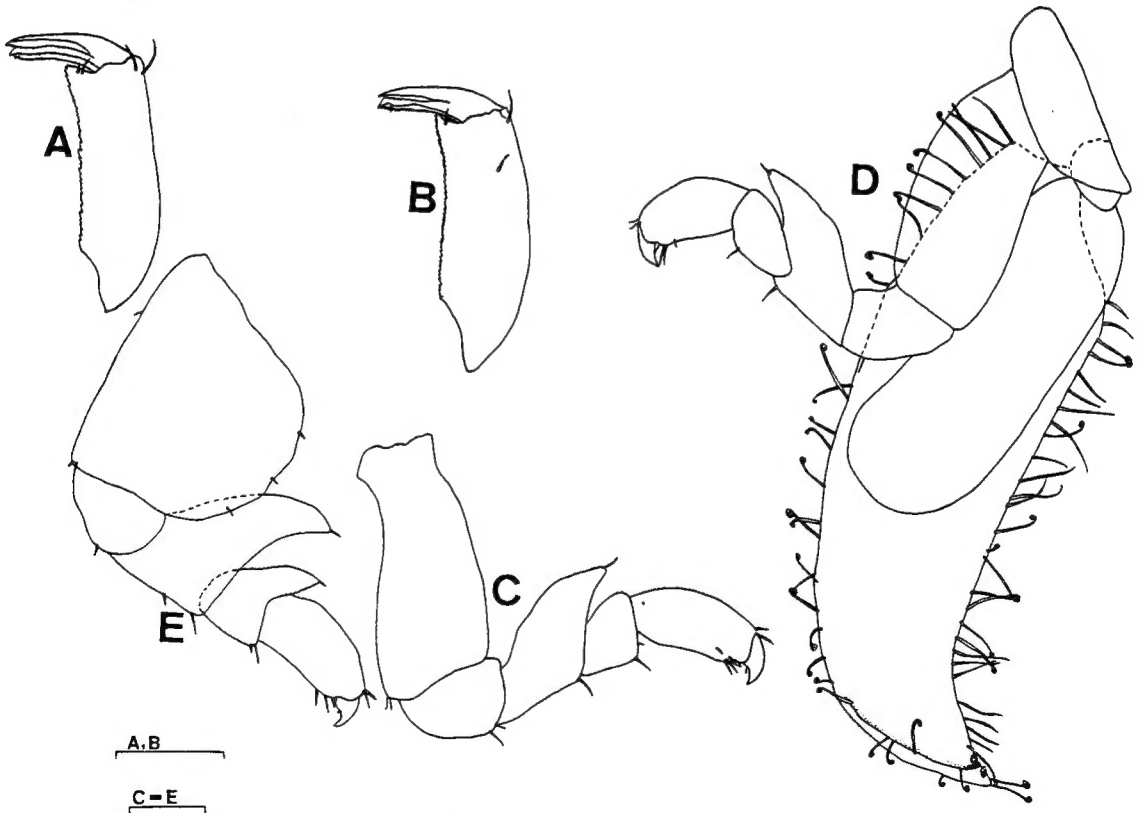
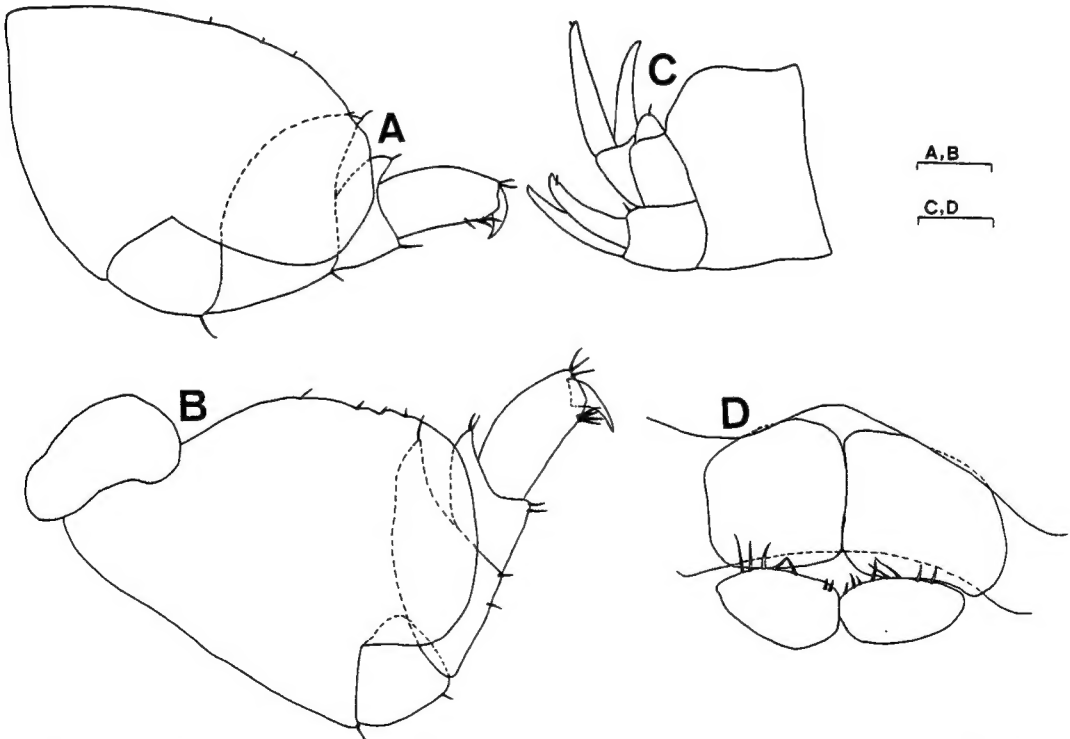


Fig. 7. *Ceinina japonica* Stephensen, 1933, ovigerous female, body length 5mm: A,B, article 6 and dactyl of gnathopods 1,2 respectively; C, right pereopod 3; D, right pereopod 4, gill, and oostegite; E, left pereopod 5, Scale bars = 0.2mm.

Each mandible (Fig. 6C, D) with incisors bearing three blunt teeth; lacinia mobilis armed with four deeply grooved teeth; mandibles without molar and spines. Lower lip (Fig. 6E) without inner lobe, Inner plate of maxilla 1 (Fig. 6F) narrow and short, armed with one long seta on apex and several small setae on lateral margin; outer plate broad, armed with eight strong, denticulated spines and with several small setae on outer margin; maxilla 1 without palp, Plates of maxilla 2 (Fig. 6G) almost equal in length and breadth; outer plate with 10 spines on apex; inner plate with two strong spines and three slender spines on inner distal margin and one strong, falciform spine on inner medial margin. Inner plate of maxilliped (Fig. 6H) almost overreaching to distal end of outer plate, with two triangular teeth and one blunt tooth and several spines on truncate apex; outer plate with a few spines and setae on apex; palp exceeding plates by two distal articles of palp, articles of palp decreasing in breadth consecutively to distal part, article 4 with one stout distal spine and two distal setae.

Articles 5 of each gnathopod (Fig. 7A, 8) long. In gnathopod 2, article 5 slightly longer than article 6. In gnathopods 1,2, ventral margin of article 6 denticulated, produced distally; dactyl with small toe and small accessory blade and covered with three rows of slender spinules.

In pereopods 3,4 (Fig. 7C, D), article 2 slightly expanded; article 6 with one small spine and two or three setae on hinge point with dactyl; dactyl short and strong. In pereopods 5-7 (Fig. 7E; Fig. 8A, B), article 2 broadened ventrally, especially article 2 of pereopod 7 extremely expanded and elongated; article 6 widened.



**Fig. 8.** *Ceinina japonica* Stephensen, 1933, ovigerous female, body length 5mm: A, left pereopod 6; B, left pereopod 7; C, right urosomites and uropods; D, dorsal view of uropod 3 and telson. Scale bars: A,B=0.2mm; C,D=0.1mm.

Peduncles of pleopods (Fig. 6J) moderately expanded, with two denticulated coupling spines on inner margin; inner ramus broadened subproximally.

Peduncle of uropod 1 (Fig. 8C) shorter than rami, rami almost equal in length. Uropod 3 vestigial, reduced into one circular lobe bearing a few setae.

Telson (Fig. 8D) composed of two separated circular lobes.

Posteroventral corners of pleonal epimera 1-3 (Fig. 6I) almost rectangular in shape; ventral margins of pleonal epimera 1,2 densely setose.

Brood plates (Fig. 7D) extremely large, covered with short, simple setae and partly curl-tipped setae on outer margin.

**Remarks:** The present specimens differ from type specimens in following characters which valued as variations. (1) Dactyls of gnathopods 1,2, in type specimens, bear large toes, while those toes are small in the present specimens. (2) Setae which covered brood plates of type specimens are not curl-tipped, while in the present specimens, those setae are composed of not curl-tipped setae and curl-tipped ones.

**Habitat:** Penetrating into the stem of a species of algae, *Undaria pinnatifida*.

**Type Locality:** Yoichi, Hokkaido (the coast of the Sea of Japan).

**Distribution:** Korea, Japan.

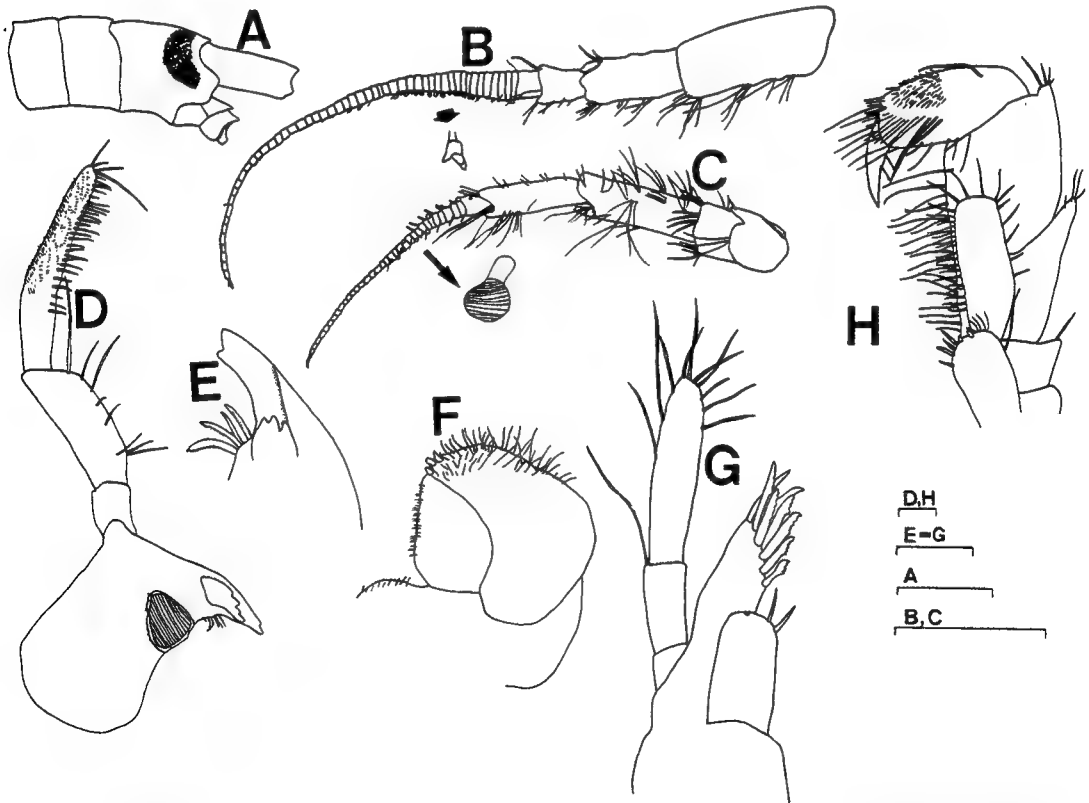


Fig. 9. *Eusiroides monoculoides japonicus* Hirayama, 1985, male, body length 8.5mm: A, head and pereonites 1,2; B, left antenna 1; C, left antenna 2; D, left mandible; E, distal part of right mandible; F, right part of lower lip; G, left maxilla 1; H, right maxilliped. Scale bars: A-C=1mm; D-H=0.2mm.

## Family Eusiridae Stebbing, 1888

## Key to Genera of Eusiridae from Ulreung Island

Accessory flagellum distinctly articulate ----- *Eusiroides*Accessory flagellum usually absent, when present, formed of one fused scale or process, not articulate ----- *Pontogeneia*Genus *Eusiroides* Stebbing, 18884. *Eusiroides monoculoides japonicus* Hirayama, 1985

(Figs. 9-11)

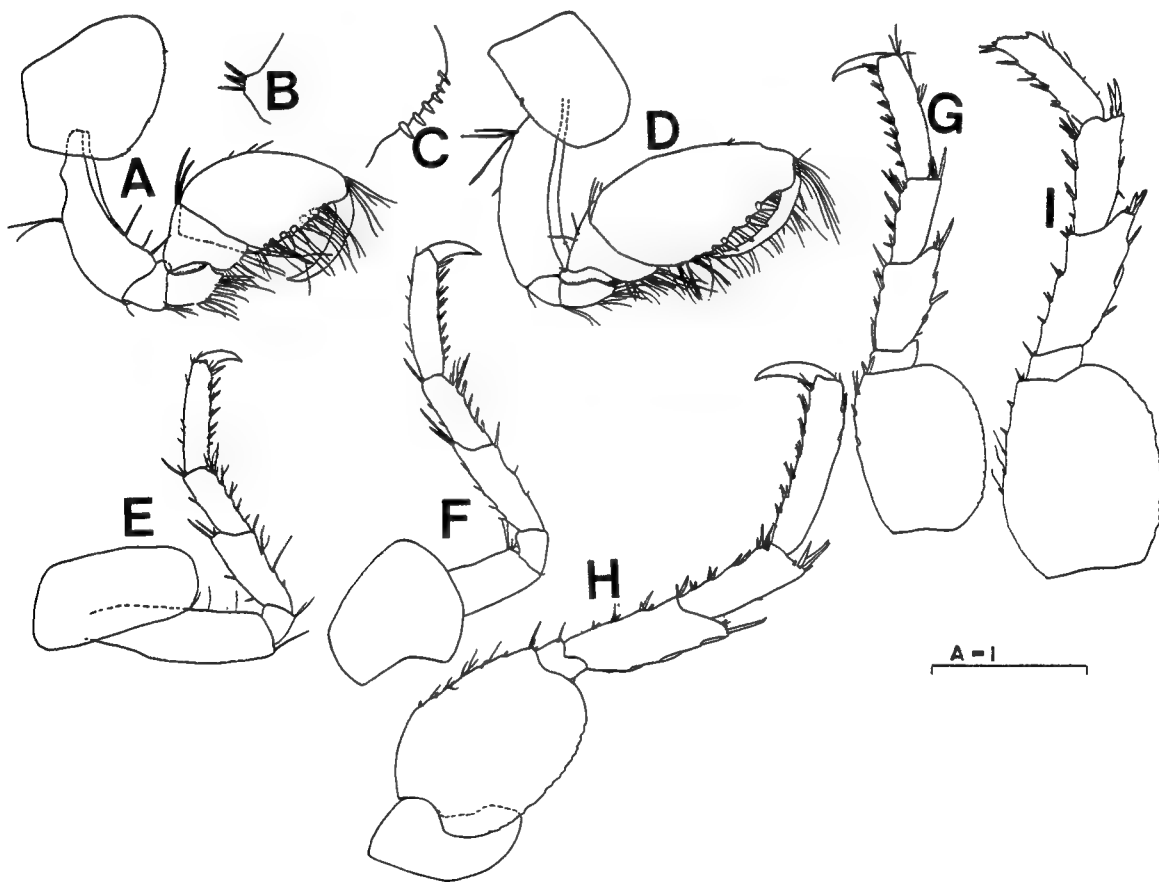
*Eusiroides monoculoides japonicus* Hirayama, 1985 (pp. 36-43, figs. 148-154).**Material Examined:** 6♂♂, Kulam, July 11, 1989; 5♂♂, Taepungch'wi, July 15, 1989; 2♂♂, Hyölam, July 14, 1989; 1♂, Tonggumi, July 12, 1989.

Fig. 10. *Eusiroides monoculoides japonicus* Hirayama, 1985, male, body length 8.5mm: A, outer view of right gnathopod 1; B, inner view of distal part of article 2 of gnathopod 1; C, inner view of palm of gnathopod 1; D, outer view of right gnathopod 2; E, right pereopod 3; F, right pereopod 4; G, right pereopod 5; H, right pereopod 6; I, right pereopod 7 (dactyl was broken). Scale bars = 1mm.

**Description of male:** Lateral cephalic lobe (Fig. 9A) rectangular in shape. Eye large and reniform in shape.

Accessory flagellum of antenna 1 (Fig. 9B) uni-articulate, not reaching to distal end of segment 1 of primary flagellum; primary flagellum composed of about 54 segments; calceoli on primary flagellum small, concave dish in shape. Peduncular articles of antenna 2 (Fig. 9C) densely covered with setae; flagellum composed of about 38 segments; calceoli on flagellum relatively large and flat dish in shape.

Mandibles (Fig. 9D, E) with incisors bearing two blunt teeth; lacinia mobilis armed with four or three blunt teeth in left and right mandibles; spines row composed of two or three denticulate spines and a few slender spines; palp tri-articulate, inner margin of article 3 covered with a row of stiff setae, outer margin and lateral surface densely covered with short setae. Inner and outer lobes of lower lip (Fig. 9F) coalescent, pubescent, with three small spines on apex. Inner plate of maxilla 1 (Fig. 9G) with two setae on inner subapical margin; outer plate with eight serrate spines; palp biarticulate, article 2 with three setae on outer margin. Outer plate of maxilla 2 longer and broader than inner plate, inner plate with several stiff setae on inner surface. Outer distal corner of articles 2,3 of maxillipedal palp (Fig. 9H) with a few slender spines; article 4 of maxillipedal palp with two setae on medial part of ventral margin.

Coxa 1 (Fig. 10A) produced roundly dorsally; article 4 of gnathopod 1 (Fig. 10B, C) produced with sharp tip ventrodistally; palm with six strong spines and defined with two small spines on inner surface. Coxa 2 (Fig. 10D) with one spine on medial part of ventral margin; palm of gnathopod 2 with seven strong spines and defined with two small spines on inner surface.

Pereopods 3,4 (Fig. 10E, F) almost equal in length and shape; locking spine of article 6 on hinge point with dactyl straight and sharp. Pereopods 5-7 (Fig. 10G-I) similar in shape. In pereopods 5-7, ventral margin of article 2 slightly serrated; locking spines of article 6 on hinge point with dactyl straight and sharp.

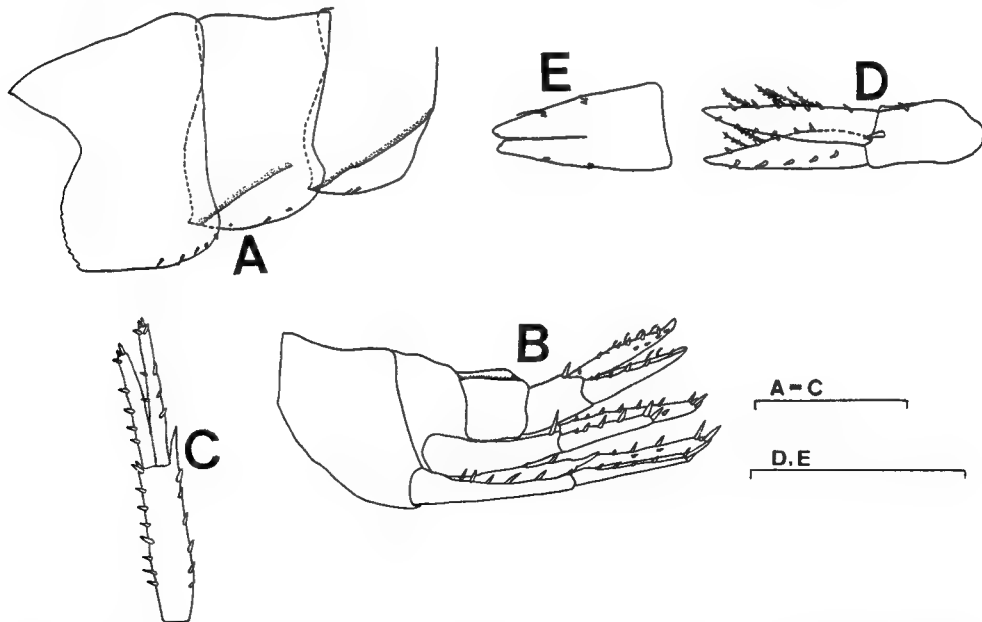


Fig. 11. *Eusiroides monoculoides japonicus* Hirayama, 1985, male, body length 8.5mm: A, right pleonal epimera 1-3; B, left urosomites and uropods; C, right uropod 1; D, right uropod 3; E, dorsal view of telson. Scale bars = 1mm.

Uropod 1 (Fig. 11C) almost reaching to distal end of uropod 2; peduncle longer than rami, inner distal corner strongly produced with sharp tip. Peduncle of uropod 3 (Fig. 11B, D) about 60% as long as rami; each ramus with two or four plumose setae on outer margin.

Telson (Fig. 11B, E) clefted into almost 50% of telson length; each lobe with two bundles of setae composed of two setae on dorsal surfaces; apices of each lobe slightly bilobed, with one seta.

Posteroventral corners of pleonal epimera 1,2 (Fig. 11A) slightly produced with pointed tip and posterior margins convex; pleonal epimera 1,2 with lateral ridges. Pleonal epimeron 3 slightly rectangular in shape; posterior margin convexly rounded, with about eight upturned teeth.

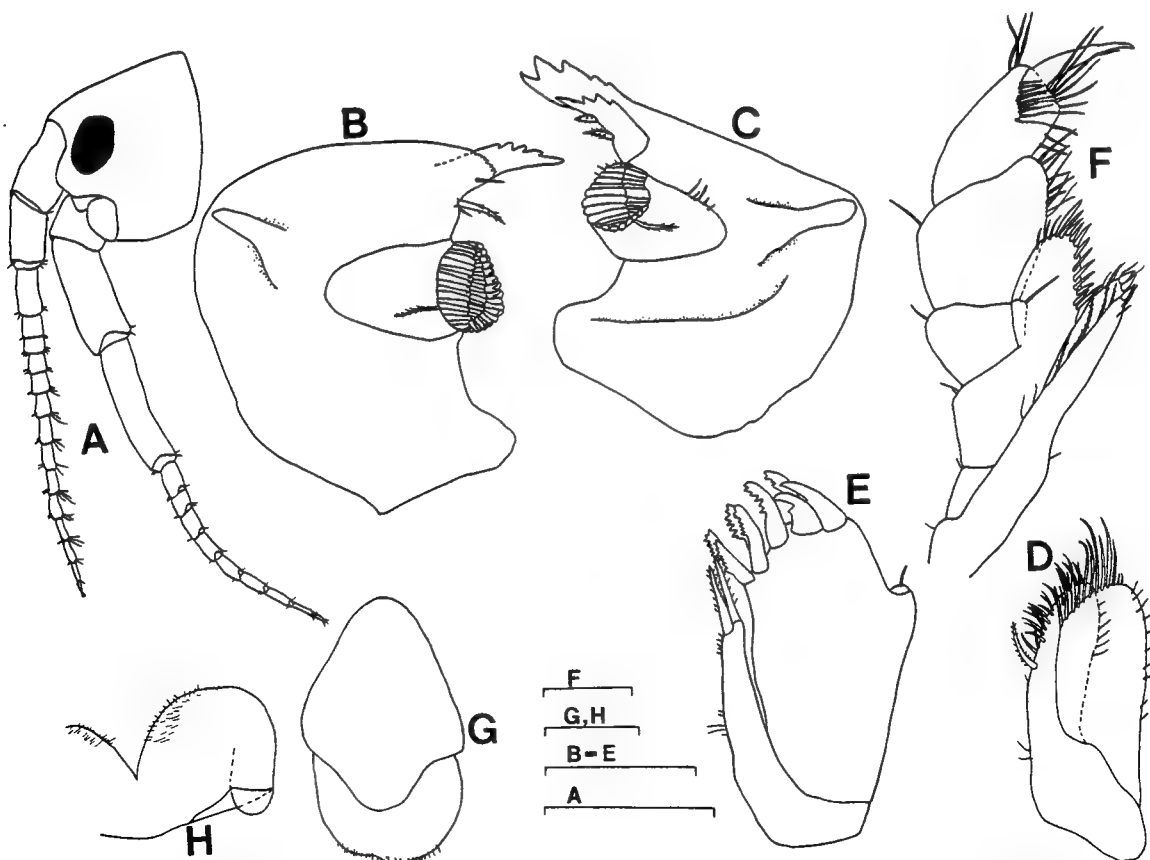
**Type Locality:** Shijiki Bay, Japan.

**Distribution:** Korea, Japan.

Genus *Pontogeneia* Boeck, 1871

##### 5. *Pontogeneia rostrata* Gurjanova, 1938

*Pontogeneia rostrata* Gurjanova, 1938 (p. 330, fig. 39); 1951 (p. 719, fig. 500); Barnard, 1962 (p. 81); 1964 (pp.



**Fig. 12.** *Allorchestes angusta* Dana, 1856, male, body length 7.5mm: A, head and antennae; B, left mandible; C, right mandible; D, right maxilla 2; E, right maxilla 1; F, left maxilliped; G, upper lip; H, lower lip. Scale bars: A = 1mm; B-F = 0.4mm; G, H = 0.5mm.

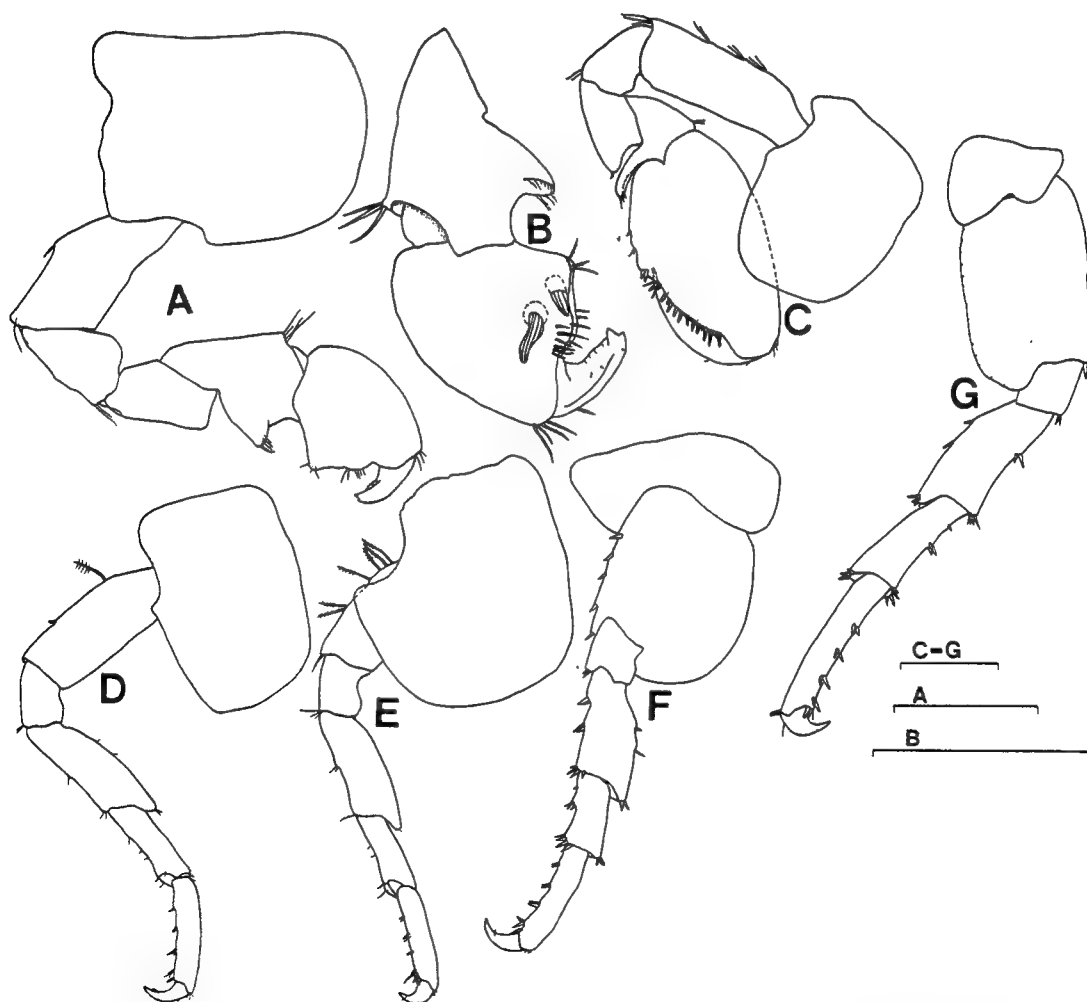
114-116, Fig. 20); 1969 (pp. 111-114); 1979 (p. 49, figs. 25-27); Nagata, 1960 (pp. 171-173, pl. XV, figs. 72-79, pl. XVI, figs. 80-92); 1965 (pp. 185, 186, fig. 26); Kim and Kim, 1987 (pp. 8,9, fig. 7).

**Material Examined:** 13 specimens, Taepungch'wi, July 15, 1989; 13 specimens, Sadong, July 17, 1989; six specimens, Sömmok, July 16, 1989; three specimens, Tonggumi, July 12, 1989.

**Type Locality:** Petrov Island, Japan Sea.

**Distribution:** Korea (Cheju Island, Ulreung Island); Petrov Island, Japan Sea; Bering Sea; Okhotsk Sea; Japan; Mexico.

Family Hyalidae Bulycheva, 1957



**Fig. 13.** *Allorchestes angusta* Dana, 1856, male, body length 7.5mm: A, outer view of right gnathopod 1; B, inner view of articles 5-7 of right gnathopod 1; C, right gnathopod 2; D, outer view of right pereopod 3; E, outer view of right pereopod 4; F, inner view of right pereopod 5; G, outer view of right pereopod 6. Scale bars = 0.5mm.

### Key to Genera of Hyalidae from Ulreung Island

Palp of maxilla 1 vestigial ----- *Allorchestes*  
 Palp of maxilla 1 well developed ----- *Hyale*

Genus *Allorchestes* Dana, 1849

#### 6. *Allorchestes angusta* Dana, 1856

(Figs. 12-14)

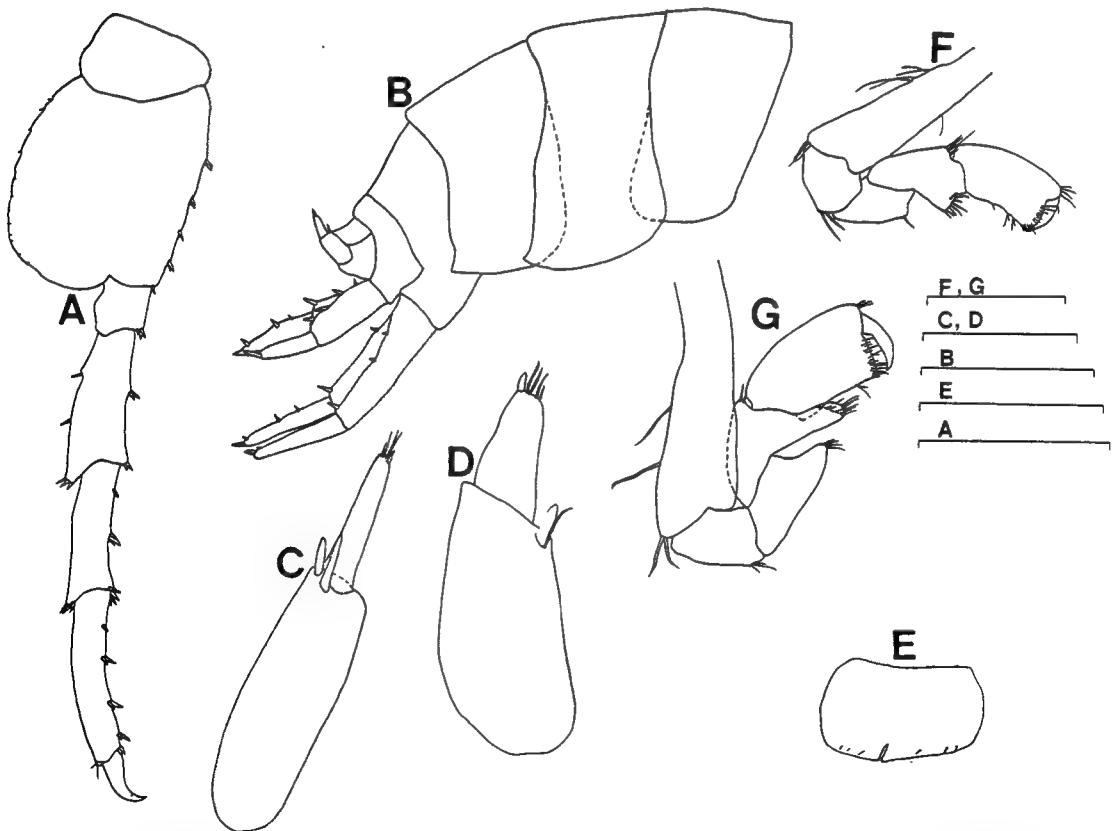
*Allorchestes angustus* Dana, 1856 (p. 177); Barnard, 1952 (pp. 20-23, pl. 5, figs. 2-6).

*Allorchestes angusta*: Barnard, 1972a (p. 42); 1979 (pp. 91, 94, figs. 50-52).

*Allorchestes malleolus* Stebbing, 1899 (pp. 406, 410, pl. 33A); Iwasa, 1939 (pp. 285-288, figs. 20-22, pl. 20); Bulycheva, 1957 (pp. 115-118, fig. 43).

*Allorchestes vladimiri* Derzhavin, 1937 (pp. 95, 96, pl. 5, fig. 2); Gurjanova, 1951 (p. 822, fig. 575).

**Material Examined:** 2♂♂, 1♀ (ovig.), Dodong, July 11, 1989.



**Fig. 14.** *Allorchestes angusta* Dana, 1856, male, body length 7.5mm: A, right pereopod 7; B, lateral view of right pleonites, urosomites, uropods, and dorsal view of telson; C, left uropod 3; D, right uropod 3; E, telson. Ovigerous female, body length 7mm: F, right gnathopod 1; G, right gnathopod 2. Scale bars: A,B,E=1mm; C,D=0.4mm; F,G=0.5mm.

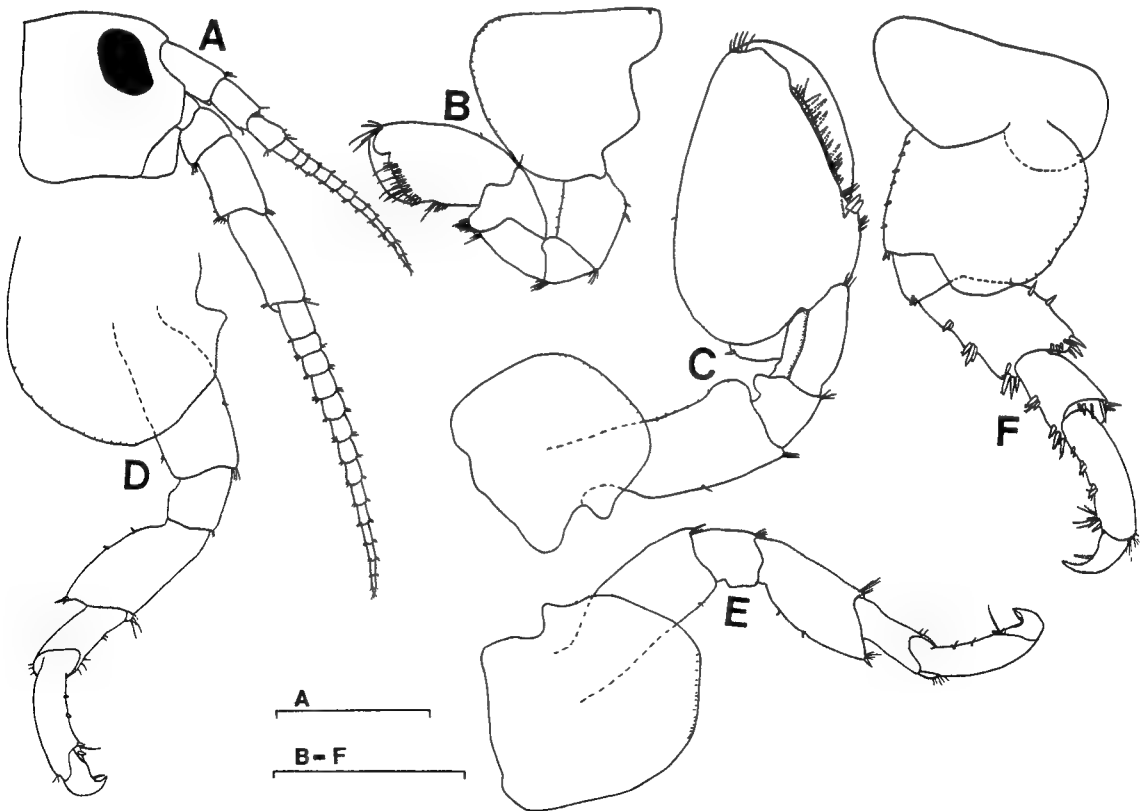


**Description of male:** Lateral cephalic lobe (Fig. 12A) extended, broad and obliquely truncated. Eye sub-circular and black.

Antenna 1 (Fig. 12A) almost reaching to distal end of peduncular article 4 of antenna 2; flagellum about 1.5 times as long as peduncular articles combined, composed of about 13 segments. Peduncular articles 3-5 of antenna 2 stout, poorly armed laterally; flagellum shorter than peduncle, segments of flagellum well separated, flagellum composed of about nine segments.

Mandible (Fig. 12B, C) with incisor bearing five teeth; lacinia mobilis of left mandible armed with four teeth, of which the longest one serrated, lacinia mobilis of right one with five teeth; spine row composed of one or two spines. Inner plate of maxilla 1 (Fig. 12E) with two strong plumose setae on apex; outer plate with eight to nine denticulated spines on apex; palp vestigial, with one long seta on apex. Lobes of maxilla 2 (Fig. 12D) almost equal in length; inner lobe with one strong plumose seta on medial part of inner margin; outer lobe broader than inner lobe.

Article 2 of gnathopod 1 (Fig. 13A, B) with slightly concave dorsal margin; ventral margin of article 5 produced narrowly; article 6 hammer in shape, produced at palmar corner, palm slightly convex; medial part of inner face of article 6 with one falcate spine subdistally and one elongated spine on more proximal part; dactyl shorter than palm, not heavily expanded, and with bifid apical nail.



**Fig. 15.** *Hyale punctata* Hiwatari and Kajihara, 1981, male, body length 15mm: A, head and antennae; B, left gnathopod 1; C, right gnathopod 2; D, left pereopod 3; E, left pereopod 4; F, left pereopod 5, Scale bars = 1mm.

Palm on article 6 of gnathopod 2 (Fig. 13C) shorter than ventral margin of article 6, and lined with spines, defined by two spines; dactyl not bifid, ordinary, and distal part inserted into palmar pocket.

Dactyls of pereopods 3-7 (Figs. 13D-G; 14A) with sharp apical nails, and weak setules near base of nail, ventral margins of dactyls weakly castellate; locking spines on article 6 of pereopods 3-7 composed of one simple spine and next one pair of proximal spines very close to locking spines.

Peduncle of uropod 1 (Fig. 14B) with one or two spines on each margin of dorsal surface and one spine on each margin of dorsal surface distally; outer ramus without spines on dorsal margin; inner ramus with two spines. Outer ramus of uropod 2 without spines on dorsal margin; inner ramus with one or two spines on dorsal margin. Peduncle of uropod 3 (Fig. 14C, D) elongated, with one or two apical spines; apex of ramus with three or four setules and one short, strong spine.

Telson (Fig. 14E) rectangular in shape, broader than long, and slightly cleft.

Body not dorsally carinate; posteroventral corners of pleonal epimera 2,3 (Fig. 14B) moderately produced.

**Description of female:** Differing from males in the following characteristics: Antenna 2 shorter and thinner than antenna 2 of male. Ventral margin of article 5 of gnathopod 1 (Fig. 14F) produced weakly; article 6 with broad palm, slightly produced in palmar corner; dactyl slenderer than one of male, not bifid, and fitting palm. Ventral margin of article 4 of gnathopod 2 (Fig. 14G) produced distally; ventral lobe of article 5 large and long; article 6 broader than article 6 of female gnathopod 1.

**Habitat:** Collected in fishing net; depth unknown.

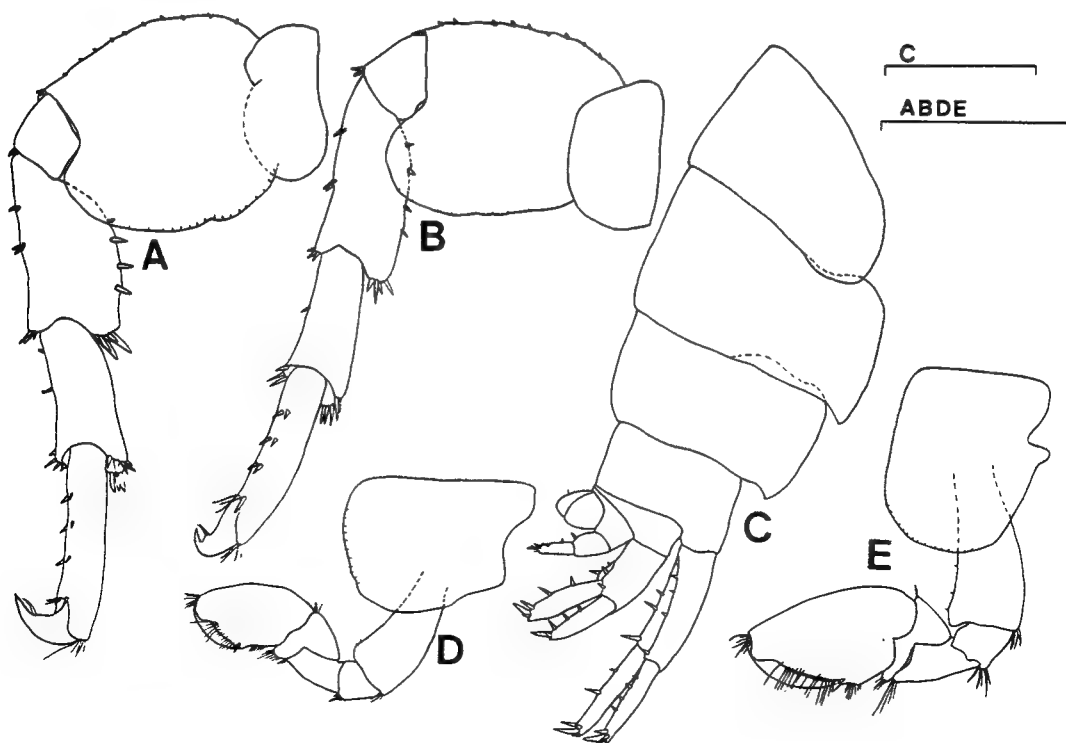


Fig. 16. *Hyale punctata* Hiwatari and Kajihara, 1981, male, body length 15mm; A, left pereopod 6; B, left pereopod 7; C, lateral view of right pleonites, urosomites, uropods, and telson. Female, body length 18mm; D, left gnathopod 1; E, left gnathopod 2. Scale bars = 1mm.

Type Locality: 34°14'N, 129°34'E, Korlo-sho, Andrea, 1869 [Thushima, Japan].

Distribution: Korea, Japan, Kurile Islands, Alaska, California.

Genus *Hyale* Rathke, 1837

# Key to Species of Genus *Hyale* from Ulreung Island

1. Ventral margin of antenna 2 densely lined with setae ..... *H. bisaeta*  
    Ventral margin of antenna 2 not densely lined with setae ..... 2
2. Antennae short; with inner large spine separated from next proximal spine by especially long gap on the apex of peduncle of uropod 1 ..... *H. punctata*  
    Antennae long; spines of peduncle of uropod 1 normal ..... *H. rubra*

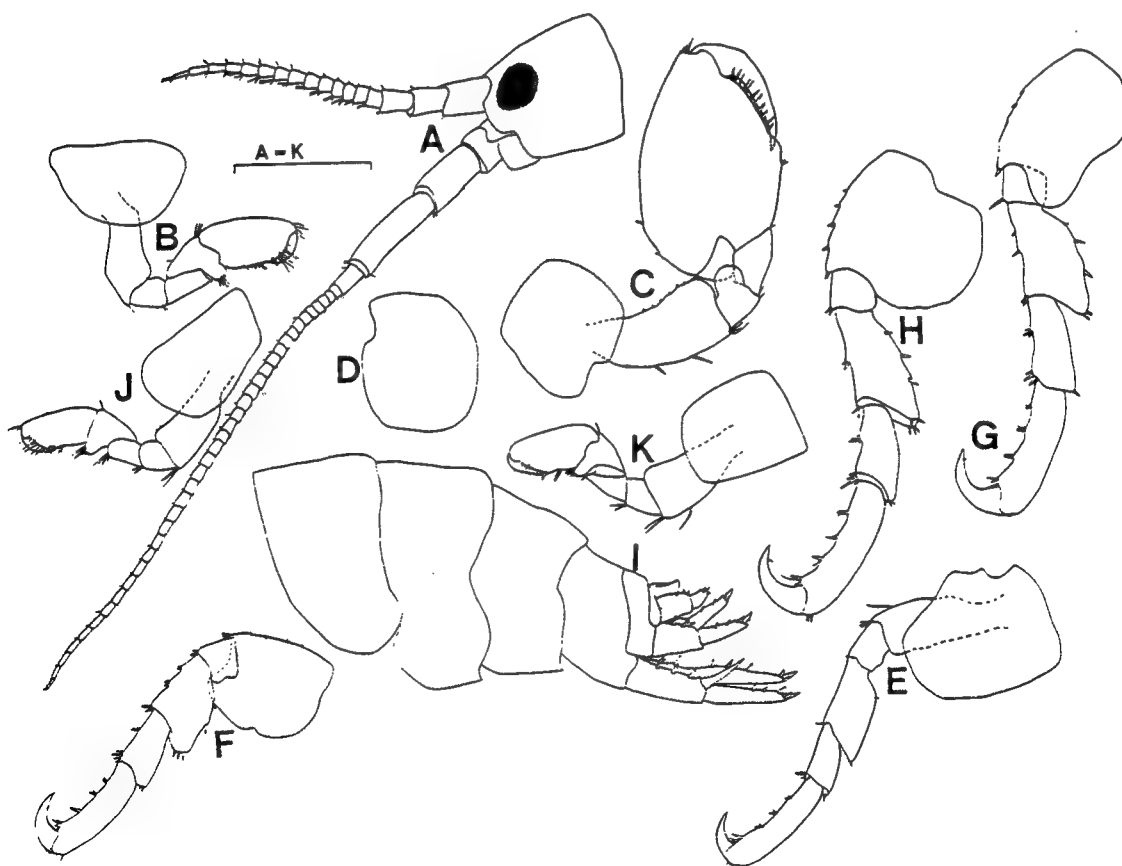


Fig. 17. *Hyale rubra* (Thomson, 1879), male, body length 8.5mm: A, head and antennae; B, right gnathopod 1; C, right gnathopod 2; D, right coxa 3; E, right pereopod 4; F, left pereopod 5; G, left pereopod 6; H, left pereopod 7; I, lateral view of left pleonites, urosomites, uropods, and telson. Female, body length 8.3mm: J, left gnathopod 1; K, left gnathopod 2. Scale bars = 1mm.

### 7. *Hyale punctata* Hiwatari and Kajihara, 1981 (Figs. 15, 16)

*Hyale punctata* Hiwatari and Kajihara, 1981 (pp. 26-30, figs. 4-6); Kim and Kim, 1987 (pp. 15, 16, fig. 13); Kim and Choe, 1987 (p. 380); Choe and Yum, 1988 (p. 272).

*Hyale novaezealandiae*: Iwasa, 1939 (pp. 276-278, fig. 16, pl. 16) [Not *Hyale novaezealandiae* (Thomson, 1879)].

**Material Examined:** 34 specimens. Hyölam, July 14, 1989; 3♂♂, 5♀♀, Tonggumi, July 12, 1989; five specimens, Naesujön, July 12, 1989.

**Type Locality:** Aburatsubo, Kanagawa Prefecture, Japan.

**Distribution:** Korea, Japan.

### 8. *Hyale rubra* (Thomson, 1879) (Fig. 17)

*Nicea rubra* Thomson, 1879 (p. 236, pl. 10B, fig. 3).

*Hyale rubra*: Hurley, 1957 (pp. 910-913, figs. 2, 3); Barnard, 1974 (pp. 67, 71, 72, figs. 43-45); 1979 (pp. 101, 102, fig. 56); Kim and Kim, 1987 (pp. 16, 17, fig. 14).

*Hyale schmidtii*: Iwasa, 1939 (pp. 278-280, fig. 17, pl. 17) [Not *Hyale schmidtii* (Heller, 1866)].

**Material Examined:** 51 specimens, Sadong, July 17, 1989; 89 specimens, Taepungch'wi, July 15, 1989; 45 specimens, Sömmok, July 16, 1989; 148 specimens, Hyölam, July 14, 1989; 11 specimens, Naesujön, July 12, 1989; 2♂♂, Kulam, July 11, 1989.

**Type Locality:** Dunedin, Australia.

**Distribution:** Australia, Korea, Japan, Hawaii, Juan Fernan dez Islands, Peru, Chile.

### 9. *Hyale bisaeta*, new species (Figs. 18-20)

*Hyale crassicornis*: Kim and Kim, 1987 (pp. 14, 15, fig. 12) [Not *Hyale crassicornis* (Haswell, 1880)].

**Material Examined:** Holotype: ♂, body length 12mm, Sömmok, July 16, 1989. Paratypes: 2♀♀, collection details same as holotype; 5♂♂, 6♀♀, Naesujön, July 12, 1989.

**Additional Materials:** 18♂♂, 16♀♀ (6 ovig.), Taep'o, Cheju Island, Aug. 14, 1985 (H.S. Kim, & C.B. Kim).

**Description of male:** Lateral cephalic lobe (Fig. 18A) broad and round. Eye medium in size and black.

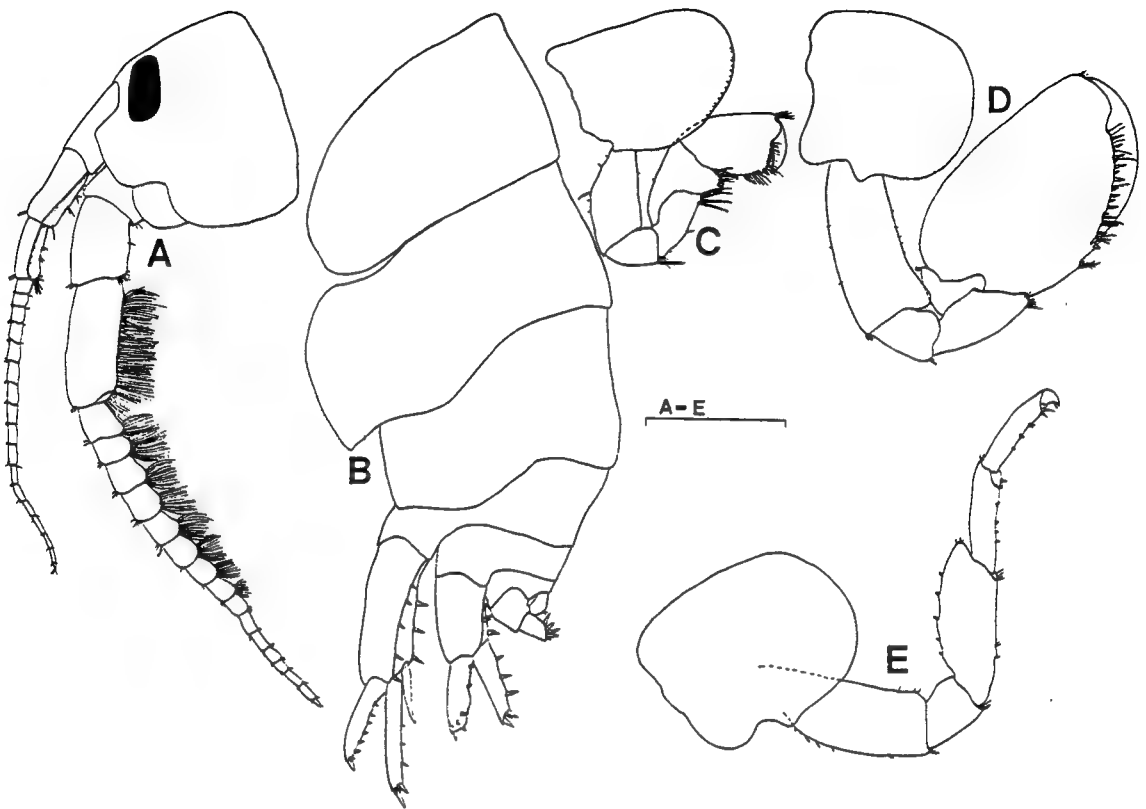
Antenna 1 (Fig. 18A) almost reaching to distal end of flagellar segment 5 of antenna 2; peduncular articles 2,3 with lateral grooves and several bundles of setae on ventral margins; flagellum weakly setose and composed of about 17 segments. Peduncle of antenna 2 thick; peduncular article 5 and first flagellar segments 7-9 densely setose ventrally.

Nail on article 4 of maxillipedal palp (Fig. 20E) relatively small.

Coxa of gnathopod 1 (Fig. 18C) with one weak projection on ventral margin; article 2 with one stout spine on medial part of ventral margin; ventral margin of article 4 produced distally; ventral lobe of article 5 broad and spinose; article 6 broad, slightly dilatant toward distal part, ventral margin covered with small setae on proximal part and relatively long setae on distal part, these groups of setae well separated; palm slightly oblique, smooth, defined by one spine on inner surface and one spine on outer surface; dactyl fitting palm.

Coxa of gnathopod 2 (Fig. 18D) with one moderate projection on ventral margin; palm on article 6 oblique, lined with spines and setae, almost as long as ventral margin; dactyl fitting palm.

Each coxa of pereopods 3,4 (Fig. 18E; 19A) with one moderate projection on posterior margin. Each pereopod with one simple locking spine on ventral margin of article 6 and next one small proximal spine



**Fig. 18.** *Hyale bisaeta*, new species, holotype male, body length 12mm: A, head and antennae; B, lateral view of left pleonites, urosomites, uropods, and telson; C, right gnathopod 1; D, right gnathopod 2; E, right pereopod 3. Scale bars = 1mm.

very close to locking spine; dactyls of each pereopod with one setule near base of nail and with weak castellations on inner part.

Posteroventral corner of pleonal epimeron 1 (Fig. 18B) almost round; posteroventral corner of pleonal epimeron 2 roundly produced; posteroventral corner of pleonal epimeron 3 weakly produced; pleonal epimera 1-3 without lateral ridges.

Peduncle of uropod 1 (Fig. 18B) with one enlarged spine on inner margin of dorsal surface, and one small spine on outer margin of dorsal surface distally; outer rami of uropods 1,2 with five or two spines on dorsal margins, inner rami with three spines on dorsal margins. Peduncle of uropod 3 (Fig. 20F) with one strong spine on dorsolateral margin and a longitudinal row of about four setae on protuberant part dorsodistally; ramus longer than peduncle, apex of ramus obliquely truncated and with about seven spines.

Telson (Fig. 20G) fully cleft, triangular in shape, and with one apical seta.

**Description of female:** Differing from males in the following characteristics: Article 4 of gnathopod 1 (Fig. 20H) densely setose compared with article 4 of male gnathopod 1; article 6 not strongly produced, ventral margin with strongly concave part. Article 6 of gnathopod 2 (Fig. 20I) broader than article 6 of female gnathopod 1; dorsal margin of article 2 roundly produced distally; ventral margin of article 4 strongly produced distally.

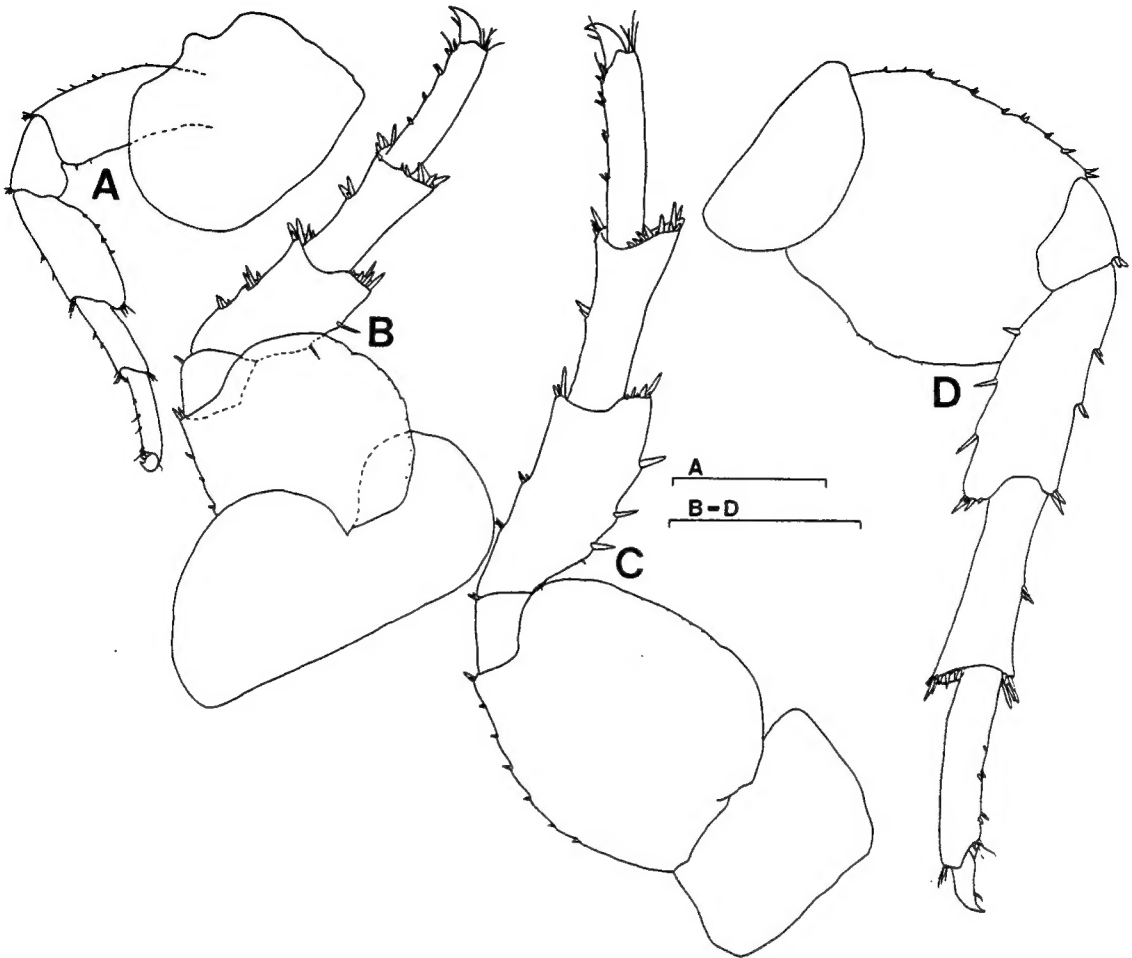


Fig. 19. *Hyale bisaeta*, new species, holotype male, body length 12mm: A, right pereopod 4; B, right pereopod 5; C, right pereopod 6; D, right pereopod 7, Scale bars = 1mm.

**Remarks:** The present species is very closely related to *Hyale crassicornis* (Haswell, 1880) in many characteristics. But, the present species differs from *H. crassicornis* in the following characteristics: (1) Male gnathopod 1 of this new species with two groups of setae on ventral margin of article 6. But, *H. crassicornis* with one group of setae there; (2) Rami of uropod 1 of the present species with more dorsal spines than that of *H. crassicornis* (the present species: five dorsal spines and three dorsal spines on outer and inner rami respectively; *H. crassicornis*: three dorsal spines and one dorsal spine on outer and inner rami respectively); (3) The number of setae on ventral margin of article 6 of female gnathopod 2 of this new species is less than that of *H. crassicornis*; (4) The present species bearing weak castellations on inner parts of dactyls of pereopods. But, *H. crassicornis* has not castellations there.

This new species resembles *Hyale barbicornis* Hiwatari and Kajihara, 1981, recorded from Japan, and Formosa. But, the present species differs from *H. barbicornis* in the following characteristics: (1) The apical expansions of article 6 on female gnathopods 1,2 in this new species are smaller than those of *H. barbicornis*; (2) Outer ramus of uropod 1 of the present species bearing five dorsal spines. But, *H. barbicornis* has three spines on that part.

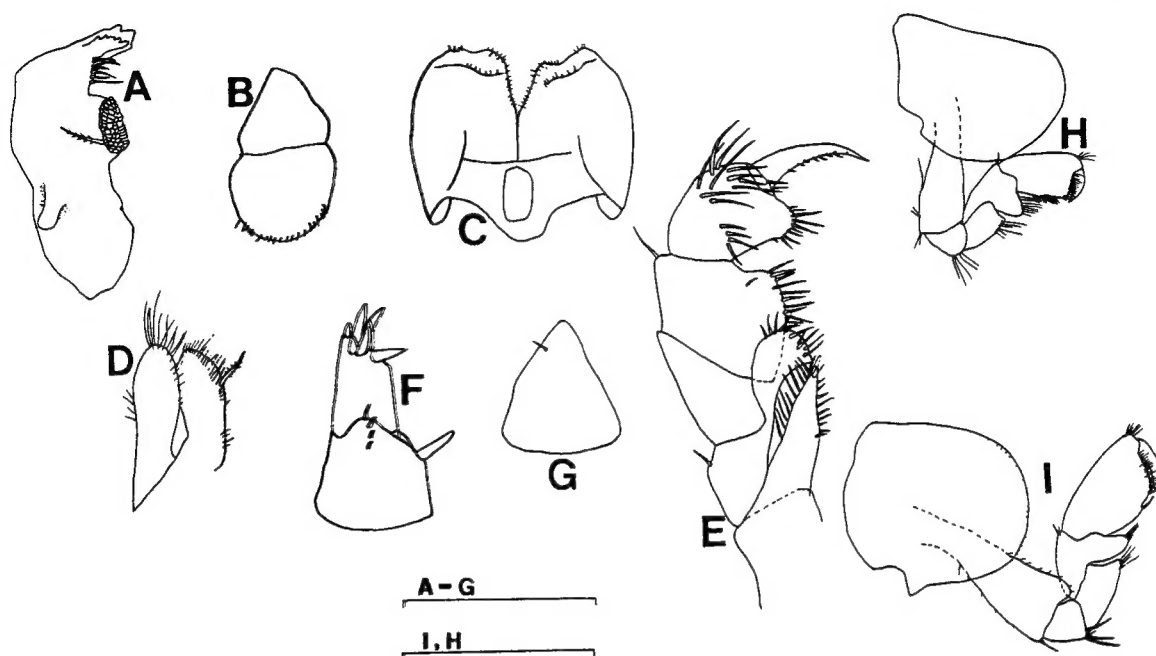


Fig. 20. *Hyale bisaeta*, new species, holotype male, body length 12mm: A, left mandible; B, upper lip; C, lower lip; D, left maxilla 2; E, left maxilliped; F, uropod 3; G, left part of telson. Female, body length 7.5mm; H, right gnathopod 1; I, right gnathopod 2. Scale bars: A-G=0.5mm; H, I=1mm.

Distribution: Korea [Ulreung Island, Cheju Island (Kim and Kim, 1987)].

Etymology: The specific name is from the Latin *bi* (two) + *saeta* (seta), referring to the two groups of setae on ventral margin of article 6 of male gnathopod 1.

## ABSTRACT

This study on the five families (Anamixidae, Colomastigidae, Eophliantidae, Eusiridae, and Hyalidae) of gammaridean amphipods of Ulreung Island was based on the materials collected at eight localities in Ulreung Island. Nine species of seven genera were identified. Of these, three (*Paranamixis denticulus*, *Colomastix prionotos*, and *Hyale bisaeta*) were new to science. Three species (*Ceinina japonica*, *Eusiroides monoculoides japonicus*, and *Allorchestes angusta*) were new records for Korean waters. These six species were described with illustrations.

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## REFERENCES

- Barnard, J. L., 1952. Some Amphipoda from central California. *Wasmann J. Biol.*, **10**, 1 : 9-36.
- Barnard, J. L., 1962. Benthic marine Amphipoda of southern California: Families Tironidae to Gammaridae. *Pacific Nat.*, **3**: 73-115, figs. 1-23.
- Barnard, J. L., 1964. Los anfipodos bentonicos marinos de la costa occidental de Baja California. *Rev. Soc. Mexicana de Hist. Nat.*, **24**: 205-274, figs. 1-11, 5 tables.
- Barnard, J. L., 1969. Gammaridean Amphipoda of the rocky intertidal of California: Monterey Bay to La Jolla. *Bull. U.S. Nat. Mus.*, 258: 1-230, figs. 1-65.
- Barnard, J. L., 1972a. Gammaridean Amphipoda of Australia. Part I. *Smith. Contrib. Zool.*, 103: 1-333, figs. 1-194.
- Barnard, J. L., 1972b. The marine fauna of New Zealand: Algae-living littoral Gammaridea (Crustacea, Amphipoda). *Dept. Sci. Indus. Res. N.Z.*, 210: 1-216, figs. 1-109.
- Barnard, J. L., 1974. Gammaridean Amphipoda of Australia. Part II. *Smith. Contrib. Zool.*, 139: 1-148, figs. 1-83.
- Barnard, J. L., 1979. Littoral gammaridean Amphipoda from the Gulf of California and the Galapagos Islands, *Smith. Contrib. Zool.*, 271: I-VI + 1-149, figs. 1-74.
- Bowman, T. E. and L. G. Abele, 1982. Systematics, fossil record, and biogeography, *In: The Biology of Crustacea* (L. G. Abele ed.). Academic Press, New York, Vol. 1. pp. 1-27.
- Bulycheva, A. I., 1957. Morskie bloxi morej SSSR i sopredel'nyx vod (Amphipoda-Talitroidea). *Opred po Faune SSSR, Akad. Nauk SSSR* **65**: 1-185, figs. 1-66 (in Russian).
- Choe, B. L. and S. S. Yum, 1988. Marine invertebrate fauna of Oeyon Islands. Report on the Survey of Natural Environment in Korea. No. 8. The Oeyon Islands, pp. 257-278 (in Korean).
- Dana, J. D., 1856. Catalogue and descriptions of Crustacea collected in California by Dr. John Le Conte. *Proceedings of the Philadelphia Academy of Natural Science*, **7**: 175-177.
- Dershavin, A. N., 1937. Talitridae of the Soviet coast of the Japan Sea. *Issledovaniya Morej SSSR* **23**: 87-112, pls. 1-6 (in Russian with English summary).
- Grube, A. E., 1861. Ein Ausflug nach Triest und dem Quarnero. *Beiträge zur Kenntniss der Thierwelt dieses Gebietes*. Berlin, Nicolaische Verlagsbuchhandlung, prefacial pp., pp. 1-175, pls. 1-5 (cited from Heard and Perlmutter, 1977).
- Gurjanova, E., 1938. Amphipoda, Gammaroidea of Siakhu Bay and Sudzukhe Bay (Japan Sea). *Rep. Japan Sea Hydrobiol. Exped. of Zool. Inst. of the Acad. Sci. USSR, 1934*, **1**: 2241-2404, figs. 1-59 (in Russian with English summary).
- Gurjanova, E., 1951. *Bokoplavy morej SSSR i sopredel'nykh vod* (Amphipoda-Gammaridea). *Opred. po Faune SSSR, Akad. Nauk SSSR* **41**: 1-1029, figs. 1-705 (in Russian).
- Haswell, W. A., 1880. On Australian Amphipoda. *Proc. Linn. Soc. New South Wales*, **4**: 245-279, pls. 7-12.
- Heard, R.W. and D.G. Perlmutter, 1977. Description of *Colomastix janiceae* n. sp. a commensal amphiod (Gammaridea: Colomastigidae) from Florida keys, U.S.A. *Proc. Biol. Soc. Wash.*, **90**, 1 : 30-42, figs. 1-3.
- Heller, C., 1866. Beiträge zur näheren kenntniss der Amphipoden des Adriatischen Meeres. *Denkschr. Akad. Wiss. Wien*, **25**, 2 : 1-57.
- Hirayama, A., 1983. Taxonomic studies on the shallow water gammaridean Amphipoda of West Kyushu, Japan. I. Acanthonotozomatidae, Ampeliscidae, Amphilochidae, Anamixidae, Argissidae, Atylidae and Colomastigidae. *Publ. Seto Mar. Biol. Lab.*, **28**, 2 : 75-150, figs. 1-42.
- Hirayama, A., 1985. Taxonomic studies on the shallow water gammaridean Amphipoda of west Kyushu, Japan. IV. Dexaminidae (*Guermea*), Eophliantidae, Eusiridae, Haustoriidae, Hyalidae, Ischyroceridae. *Publ. Seto Mar. Biol.*



- Lab., **30**, 1/3 : 1-53.
- Hiwatari, T. and T. Kajihara, 1981. Taxonomy of the family Hyalidae (Amphipoda, Crustacea) in Japan. I. Three new species of the genus *Hyale*. Proc. Jap. Soc. Syst. Zool., **20**: 21-34.
- Hurley, D. E., 1957. Studies on New Zealand amphipodan fauna. No. 14. The genera *Hyale* and *Allorchestes* (family Talitridae). Trans. Roy. Soc. New Zealand, **84**, 4: 903-933.
- Iwasa, M., 1939. Japanese Talitridae. J. Fao. Sci. Hokkaido Imp. Univ., Ser. 6, Zool., **6**, 4: 255-296, pls. 9-20.
- Kim, H. S. and B. L. Choe, 1987. Marine benthic fauna of Paengnyongdo I., Taecheong-do I. and Socheong-do I. Report on the Survey of Natural Environment in Korea. No. 7. The Islands adjacent to Paengnyong-do, pp. 355-396 (in Korean).
- Kim, H. S. and C. B. Kim, 1987. Marine gammaridean Amphipoda (Crustacea) of Cheju Island and its adjacent waters, Korea. Korean J. Syst. Zool., **3**, 1 : 1-23.
- Kim, W. and C. B. Kim, 1991. The marine amphipod crustaceans of Ulreung Island, Korea I. Korean J. Zool., **34**, 2 : 232-252.
- Ledoyer, M., 1978. Amphipodes gammariens (Crustacea) des biotopes cavitaires organogenes recifaux de l'île Maurice (Ocean Indien). Bull. Mauritius Inst., **8**, 3 : 197-332, figs. 1-43.
- Ledoyer, M., 1979. Expedition Rumphius II (1975). Crustacés parasites, commensaux etc... (Th. Monod et R. Serene, ed). VI: Crustacés Amphipodes gammariens. Bull. Mus. Natn. Hist. Nat. Paris, ser. 4, An 1:137-181, figs. 1-19.
- Ledoyer, M., 1982. Crustacés Amphipodes Gammariens. Familles des Acanthonotozomatidae a Gammaridae. Faune de Madagascar, **59**, 1 : 1-598. Editions du C.N.R.S. Paris.
- Nagata, K., 1960. Preliminary notes on benthic gammaridean Amphipoda from the *Zostera* region of Mihara bay, Seto Inland Sea Japan. Publ. Seto Mar. Biol. Lab., **8**, 1 : 163-182, pls. 13-17.
- Nagata, K., 1965. Studies on marine gammaridean Amphipoda of the Seto Inland Sea. II. Publ. Seto Mar. Biol. Lab., **13**, 3 : 171-186, figs. 1-11.
- Nicholls, G. E., 1939. The Prophiantidae: A proposed new family of Amphipoda, with description of a new genus and four new species. Rec. So. Australian Mus., **6**: 309-334, figs. 1-10.
- Schellenberg, A., 1938. Litorale Amphipoden des tropischen Pazifiks. Kungl. Svenska Vetenskapakad. Handl., ser. 3, **16**: 1-105, figs. 1-48.
- Sivaprakasam, T. E., 1968. A new species of *Paranamixis* Schellenberg (Crustacea Amphipoda) from the Gulf of Mannar. Proc. Zool. Soc. Calcutta, **21**: 131-136, figs. 1-3.
- Stebbing, T. R. R., 1899. Amphipoda from the Copenhagen Museum and other sources, Part II. Trans. Linn. Soc. London, ser. 2, Zool., **7**: 395-432, pls. 30-35.
- Stephensen, K., 1933. *Ceinina japonica* (N. Gen., N. Sp.), a new aberrant species of the amphipodan family Talitridae from Japan. Trans. Sapporo Nat. Hist. Soc., **13**: 63-68, figs. 1-4.
- Thomson, G. M., 1879, New Zealand Crustacea, with description of new species. Trans. Proc. New Zealand, **11**: 230-248, pl. 10.

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